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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/799,020	03/11/2004	Annette Grot	10040086-1	7572

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AGILENT TECHNOLOGIES, INC.
Legal Department, DL429
Intellectual Property Administration
P.O. Box 7599
Loveland, CO 80537-0599

EXAMINER	
HUGHES, JAMES P	
ART UNIT	**PAPER NUMBER**
2883	

DATE MAILED: 10/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/799,020	GROT ET AL.	
	Examiner	Art Unit	
	James P. Hughes	2883	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *061804*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claim 8 is objected to as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The recitation to "coupled top said waveguide" does not clearly identify that which applicant regards as the invention. Does applicant mean coupled to the top of the waveguide?

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1, 5, 7, 14, 15, and 24 are rejected under 35 U.S.C. 102(e) as being anticipated by Sugitatsu et al. (2004/0062505). Sugitatsu teaches an apparatus and method comprising a 2-D photonic crystal sensor apparatus comprising: a waveguide (e.g. fiber in p. 53) for inputting light (e.g. from a laser diode or the like); and a photonic crystal slab (e.g. 4) with a periodic triangular lattice, optically coupled to said waveguide, said crystal comprising a 2-D periodic lattice of holes comprising a lattice constant and at least one defect hole (e.g. 6, 41) – a linear defect with respect to the periodic lattice. The photonic crystal slab (e.g. 4) operable to confine said light in

said defect hole at an operating wavelength. Where in the exciting light (51) may create laser emission (e.g. 52) in a direction perpendicular to said photonic crystal slab. (See e.g. p. 53-56)

During operation, a photodetector (e.g. 61) may be placed out of the plane of the photonic crystal slab to detect light at an operational wavelength of the sensor (e.g. 10). (See e.g. Fig. 16) Sugitatsu additionally teaches that the device (10) and method may be operable in an optical switch to control the passage of signals. (See e.g. p. 44-102, and Figs. 4-16)

3. Claims 1, 4, 7, 22, and 23 are rejected under 35 U.S.C. 102(e) as being anticipated by Shirane et al. (6,937,781). Shirane teaches an apparatus and method comprising a 2-D photonic crystal sensor apparatus comprising: a waveguide for inputting light (e.g. 21 from a laser diode or the like); and a photonic crystal slab (e.g. Fig. 3, 11) with a periodic triangular lattice, optically coupled to said waveguide, said crystal comprising a 2-D periodic lattice of holes comprising a lattice constant and an area of liner defect holes (e.g. 39). The photonic crystal slab (e.g. Fig. 3, 11) operable to confine said light in said defect hole at an operating wavelength. After light passes through the device it is outcoupled in a direction perpendicular to the photonic crystal slab. One embodiment of the invention employs commonly used input and output waveguides (e.g. 51, 52) (See e.g. Col. 4, ll. 60 – Col. 6, ll. 65)

Shirane additionally teaches that the device and method may be operable in an optical switch to control the passage of signals, that a silicon photonic crystal structure may be employed, and that a three-dimensional lattice structure may be employed. (See e.g. Col, 6, ll. 25-35, Col. 7, ll. 25-30, and Fig. 12)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 2, 3, and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miller et al. (2004/0027646) in view of Romagnoli et al. (2005/0175304). Miller teaches an apparatus and method for controlling the propagation of an electro magnetic radiation comprising, placing photonic band gap medium (e.g. 401) – having a surface and a photorefractive medium – in the path of the electromagnetic radiation; and projecting control radiation (e.g. light) onto the surface that spatially varies a refractive index of the photorefractive material thereacross to control propagation of the electromagnetic radiation through the bandgap medium. When the spatial control radiation is applied, a defect path is defined in the photorefractive medium, which guides the electromagnetic radiation traveling in said medium. Miller additionally teaches that the resonance (thus filtering, passband, reflection, etc..) frequency of the PBG material may be adjusted via size of the defect which enables PBG behavior. (See e.g. p. 24, 39-46, 65-67, 82 and Figs. 5-7, and 10).

Romagnoli teaches an apparatus and method comprising 2-D and 3-D photonic crystal sensor apparatus comprising: a waveguide (e.g. 5) for inputting light (e.g. 6) from laser (4) to an output waveguide (22). Additionally, a photonic crystal slab (e.g. 1) with a periodic linear triangular lattice of defect holes (2), optically coupled to said waveguide, said crystal comprising a 2-D periodic lattice of holes comprising a lattice constant and an area of liner defect holes (e.g.

p. 111). The photonic crystal slab (e.g. 1) operable to confine said light in said defect hole at an operating wavelength.

Regarding claim 1; Millar does not explicitly teach an input or outcouple waveguides. It would have been obvious to one of ordinary skill in the art at the time of the invention to employ input and output waveguides in the invention of Millar to provide light to the device and method. One would be motivated to do so because it would provide an efficient means for launching / outcoupling light to/from the crystal.

Regarding claims 2 and 3; Millar in view of Romagnoli does not teach defect holes that have a larger or smaller volume than the lattice holes.

It would have been obvious to one of ordinary skill in the art at the time of the invention to employ defect holes which have a larger or smaller volume than the lattice holes because as is well known in the art that the size of the defect hole determines the operating frequency of the device, as taught for example by Millier (See p. 24 and Figs. 6 and 7). One would have been motivated to do so because this would allow integration of the device with various input frequencies.

Regarding claim 6; neither Romagnoli nor Miller teach defect holes with a substantially elliptical cross-section. However, Miller does teach that the resonance (thus filtering, passband, reflection, etc...) frequency of the PBG material may be adjusted via the size of the defect which enables PBG behavior and that the defect's size and shape may be changed via applied energy – thus the defect holes may yield substantially elliptical cross-sections. One would have been motivated to do so because it would allow an efficient device and method via, for example, allowing the response frequencies of the device to be dynamically tuned.

5. Claims 1 and 13-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Soljacic et al. (2004/0033009) in view of Sugitatsu et al. (2004/0062505), in further view of Miller (2004/0027646). Soljacic teaches a 2-D photonic crystal sensor apparatus comprising: a photonic crystal slab comprising a 2-D period lattice of holes (e.g. filled holes 4), said slab operable to confine light at a plurality of operating wavelengths to said plurality of defect holes; and a substantially straight line of defects defining a waveguide (e.g. 14,6) optically coupling the plurality of defect holes (e.g. center rods 8). Following it is taught that the defect holes do not all have the same volume. (See e.g. p. 16-25 and Figs. 1, 7A)

Sugitatsu et al. (2004/0062505). Sugitatsu teaches an apparatus and method comprising photonic crystal sensor apparatus as discussed above.

Soljacic teaches the standard photonic crystal hole medium comprise filled rods rather than empty holes. It would have been obvious to one of ordinary skill in the art at the time of the invention to employ holes rather than filled holes (e.g. rods) as they are interchangeable in the art – as taught for example by Miller (see e.g. p. 6) – depending on the desired difference in index of refraction. As would be evident to one of ordinary skill in the art at the time of the invention attempting to make an efficient device, the apparatus is arranged in an order to maximize the optical coupling of the waveguide to the plurality of defect holes. (See e.g. p. 16-25 and Figs. 1, 7A)

It is also not explicitly taught that the photo detector employs a slope based detection system. It would have been obvious to one of ordinary skill in the art at the time of the invention to employ a slope based detection system in the invention of Sugitatsu because it would allow an efficient detection means.

6. Claims 1, 9-12, and 18-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Platzman (6,697,542). Platzman teaches an apparatus and method comprising a 2-D photonic crystal sensor apparatus comprising: a waveguide (e.g. 12) for inputting light; and a photonic crystal slab (e.g. 18) optically coupled to said waveguide, said crystal comprising a 2-D periodic lattice of holes comprising a lattice constant and at least one defect hole (e.g., 24, 26). The photonic crystal slab operable to confine said light in said defect hole at an operating wavelength. When a spatial control radiation is applied, a defect path is defined in the photorefractive medium, which guides the electromagnetic radiation traveling in said medium. Additionally, Platzman teaches that the path of light passing through the crystal may be switched. (See e.g. Col. 3, ll. 20 – Col. 6, ll. 40 and Figs. 1-2)

Platzman does not explicitly teach how the operating wavelength is selected or the number of laser inputs. It would have been obvious to one of ordinary skill in the art at the time of the invention to employ multiple lasers, a dither system, or a synchronized scanning system in the invention of Platzman because this would yield efficient means for selecting and controlling the wavelengths of light employed in the system.

Platzman does not explicitly teach numerous waveguide inputs, or the various methods that may be employed to control light input into the crystal.

Since providing multiple waveguides for launching light into an optical switch is notoriously well known in the art, as taught for example by Paniccia et al. (6,504,965), it would have been obvious to one of ordinary skill in the art at the time of the invention to provide a plurality of input waveguides into the switch of Platzman because this would yield an efficient device such as allowing switching of a plurality of bands.

Following, it would also have been obvious to one of ordinary skill in the art at the time of the invention to optically address the plurality of waveguides with a dynamically reconfigurable diffractive array generator or MEMS mirror array in the invention of Platxman because they are efficient means for directing light waves as taught, for example, by Paniccia (See e.g. Col. 7, ll. 25-45).

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1, 9, and 24 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 and 8 of copending Application No. 11/078,785 in view of Miller et al. (2004/0027646). The only recited difference between claims 1 and 24 of the instant invention and claim 1 of Application No. 11/078,785 is the intended use of tuning the crystal to detect certain particle sizes (e.g. a certain operating frequencies). It is well know that the operating frequency may be determined via adjusting the defect hole size as taught by Miller (See p. 24 and Figs. 6 and 7). Claim 9 of the instant application is the same as claim 8 of 11/078,785.

It would have been obvious to one of ordinary skill in the art at the time of the invention to tune the device of the instant application to a nanometer wavelength. One of ordinary skill in the art would have been motivated to do so because it would allow efficient operation in commonly used wavelengths, e.g. 1554 nm. Hence, the device is capable of performing the intended use.

This is a provisional obviousness-type double patenting rejection.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Sato et al. (2004/0258383) teaches a photinic crystal wherein light (11) is launched into a waveguide in the crystal via waveguide (1) and outcoupled to a second waveguide (4). (See e.g. Abstract) Leonard et al. (6,870,970) teaches an apparatus and method for controlling the propagation of an electromagnetic radiation that reads at least on claims 1, 12, and 19. (See e.g. Col. 12, ll. 55 – Col. 3, ll. 25) Poberezhskiy et al. (2003/0107799) teaches an apparatus and method for controlling the propagation of an electromagnetic radiation that reads al least on claims 1, 12, and 19. (See e.g. p. 15-20) Payne et al. (6,160,944) teaches a method and apparatus for controlling the propagation of an electromagnetic radiation (See e.g. Col. 2, ll. 55 – Col. 3, ll. 15) Shirane et al. (2002/0146196) and (6,937,781) teaches an apparatus and method for controlling the propagation of an electro magnetic radiation. (See e.g. Abstracts) Sato et al. (2004/0258383) teaches an apparatus and method for controlling the propagation of an electromagnetic radiation that reads at least on claims 1, 12, and 19. (Abstract) Sugitatsu et al.

(2004/0062505) teaches a method and apparatus for controlling the propagation of an electro magnetic radiation that reads at least on claims 1, 12, and 19. (See e.g. p. 51-57 and Fig. 2) Fridman et al. (2005/0111775) teaches a method and apparatus for controlling the propagation of an electromagnetic radiation. (Abstract) Dugan et al. (6,768,850) teaches a method and apparatus for changing a waveguide's index of refraction via applying laser radiation. (Abstract)

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James P. Hughes whose telephone number is 571-272-2474. The examiner can normally be reached on Monday - Friday 9am - 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank Font can be reached on 571-272-2415. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

James P. Hughes
Patent Examiner
Art Unit 2883

Frank G. Font
Supervisory Patent Examiner
Technology Center 2800